

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau



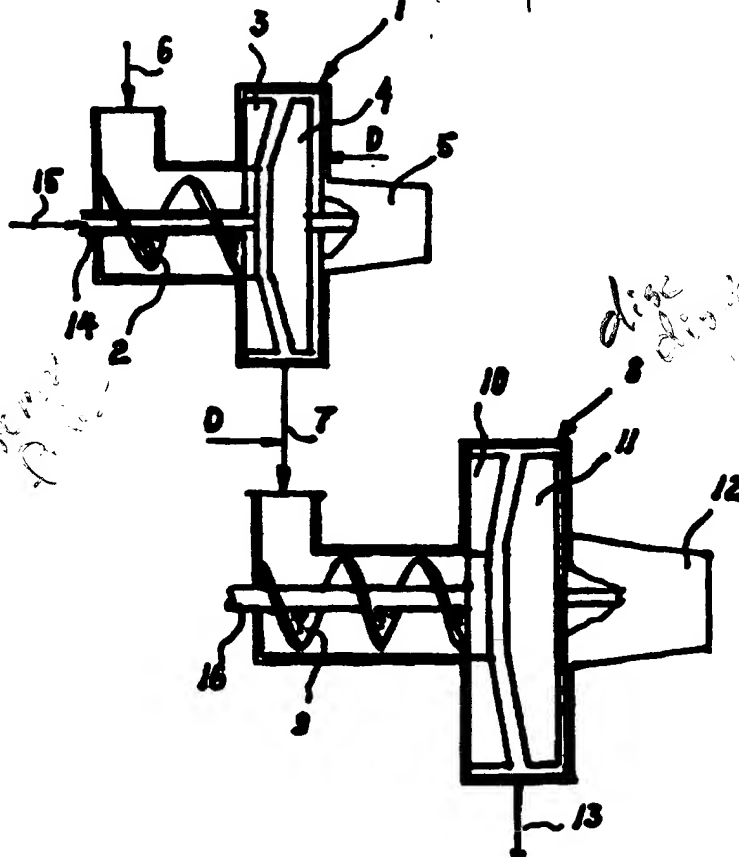
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

| | | | |
|---|--|--|--|
| (51) International Patent Classification ⁶ : D21B 1/12, 1/14 | | A1 | (11) International Publication Number: WO 96/18769 |
| | | | (43) International Publication Date: 20 June 1996 (20.06.96) |
| (21) International Application Number: PCT/NO95/00226 | | (81) Designated States: AL, AM, AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TT, UA, UG, US, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG), ARIPO patent (KE, LS, MW, SD, SZ, UG). | |
| (22) International Filing Date: 7 December 1995 (07.12.95) | | | |
| (30) Priority Data: 944847 14 December 1994 (14.12.94) NO | | | |
| (71) Applicant (for all designated States except US): KVAERNER HYMAC A.S. [NO/NO]; Joseph Kellers vei 20, N-3408 Tranby (NO). | | | |
| (72) Inventors; and (75) Inventors/Applicants (for US only): EGENES, Tom [NO/NO]; Ridderkleiva 56A, N-1370 Asker (NO). FJELLKLEIV, Terje [NO/NO]; Pedros vei 32, N-3038 Drammen (NO). NORDAL, Esten [NO/NO]; Gamlevecien 14, N-2420 Trysil (NO). | | | |
| (74) Agent: REISTAD, Gunnar, O.; Bryns Patentkontor A/S, P.O. Box 765, Sentrum, N-0106 Oslo (NO). | | | |
| | | Published With international search report. In English translation (filed in Norwegian). | |

(54) Title: MEANS FOR TREATMENT OF PARTICLE MASS

(57) Abstract

The invention relates to a device for processing particulate material comprising a grinder (1), means (2) for introducing a particulate material into the grinder, a disc disperser (8) and means (7, 9) for transferring particulate material from the grinder (1) to the disc disperser (8), means (13) for removing particulate material from the disc disperser (8); and means (14) for adding steam to the device to heat the particulate material. The invention is characterised in that the grinder (1) is a rapidly rotating grinder in the form of a disc disperser.



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

| | | | | | |
|----|--------------------------|----|---------------------------------------|----|--------------------------|
| AT | Austria | GB | United Kingdom | MR | Mauritania |
| AU | Australia | GE | Georgia | MW | Malawi |
| BB | Barbados | GN | Guinea | NE | Niger |
| BE | Belgium | GR | Greece | NL | Netherlands |
| BF | Burkina Faso | HU | Hungary | NO | Norway |
| BG | Bulgaria | IE | Ireland | NZ | New Zealand |
| BJ | Benin | IT | Italy | PL | Poland |
| BR | Brazil | JP | Japan | PT | Portugal |
| BY | Belarus | KE | Kenya | RO | Romania |
| CA | Canada | KG | Kyrgyzstan | RU | Russian Federation |
| CF | Central African Republic | KP | Democratic People's Republic of Korea | SD | Sudan |
| CG | Congo | KR | Republic of Korea | SE | Sweden |
| CH | Switzerland | KZ | Kazakhstan | SI | Slovenia |
| CI | Côte d'Ivoire | LI | Liechtenstein | SK | Slovakia |
| CM | Cameroon | LK | Sri Lanka | SN | Senegal |
| CN | China | LU | Luxembourg | TD | Chad |
| CS | Czechoslovakia | LV | Latvia | TG | Togo |
| CZ | Czech Republic | MC | Monaco | TJ | Tajikistan |
| DE | Germany | MD | Republic of Moldova | TT | Trinidad and Tobago |
| DK | Denmark | MG | Madagascar | UA | Ukraine |
| ES | Spain | ML | Mali | US | United States of America |
| FI | Finland | MN | Mongolia | UZ | Uzbekistan |
| FR | France | | | VN | Viet Nam |
| GA | Gabon | | | | |

Means for treatment of particle mass

The invention relates to a device for processing particulate material comprising a grinder, means for introducing a particulate material into the grinder; a disc disperser
5 and means for transferring particulate material from the grinder to the disc disperser, means for removing particulate material from the disc disperser; and means for introducing steam into the device to heat the particulate material.

According to conventional technique, particulate material, especially wood fibre pulp
10 and more specifically pulp containing recycled paper, can be processed by means of a plurality of process steps comprising dewatering in a dewatering zone with the aid of a screw press, thereby increasing the concentration of the pulp. From the dewatering zone the pulp is then conducted to a heating zone, where the pulp is advanced whilst steam is added. The heated pulp is subsequently fed to a disc disperser where the pulp is
15 processed to reduce the amount of impurities in the pulp, such as printer's ink, wax, bitumen and so forth.

As a rule, a slowly rotating screw is used in the heating zone where steam is added at certain points across the screw through a manifold. The steam emits thermal energy on
20 condensation, and the pulp is heated. The screw may be whole or in pieces. A preheating screw of this kind is usually dimensioned for about three minutes residence time and about 50% of filling. The speed of rotation of a preheater of this type is in the range of 5 to 15 revolutions/minute.

The slow rotation of the screw causes little mixing of the pulp, so that there may be
25 large temperature gradients in the pulp. The condensing steam will thus have poor contact with the pulp particles. The pulp particles may be quite large in a conventional preheater, so a relatively long time is required to heat the pulp particles through.

The equipment used today also requires a relatively large space. Clearly therefore, there
30 is a need for better equipment with which the process outlined hereinabove can be carried out in a faster and cheaper manner, and which occupies less space.

According to the invention, a device is therefore proposed wherein a very good mixing of steam and particulate material can be obtained so that the pulp is heated evenly, at the
35 same time as it is ensured that the pulp particles are so small that they rapidly become thoroughly heated. The pulp particles are reduced in size in that a rapidly rotating grinder is used to mix pulp and steam. Thus, according to the invention a device is

proposed for the processing of particulate material comprising a grinder, means for introducing a particulate material into the grinder; a disc disperser and means for transferring particulate material from the grinder to the disc disperser; means for removing the particulate material from the disc disperser, and means for introducing
5 steam into the device to heat the particulate material, said device being characterised in that the grinder is a disc disperser.

In the disc disperser which is used as a rapidly rotating grinder, particles will be produced that are so small they will capable of being heated through rapidly.
10

According to the invention, it is especially advantageous if the means for adding the steam open into the disperser that is used as a rapidly rotating shredder.

In a device of this kind the size of the pulp particles will be reduced so that they become
15 so small that they rapidly become thoroughly heated under the influence of the added steam. An exceptionally good mixing of steam and pulp is obtained so that the pulp is heated evenly.

In the subsequent disc disperser, the amount of the impurities in the pulp, such as
20 printer's ink, wax, bitumen and so forth will, as known from prior art, be reduced.

According to the invention, it is especially expedient for the means for adding steam to open centrally into the first disc disperser that is used as a rapidly rotating grinder.

25 According to the invention, the means for adding steam can also open centrally into the second disc disperser.

The practical realisation of the invention results in a unique preheating concept which will be capable of giving an extremely short preheating period because of the good
30 mixing of steam/pulp and the minimal size of the pulp particles.

It becomes possible to admix chemicals which bleach the pulp and/or improve the efficiency of the actual dispersion of the impurity particles in the pulp.

Of particular interest is the fact that dispersion at two temperature levels, cold and hot
35 pulp respectively, also becomes possible. In the last-mentioned case, the first disc disperser can function as a predisperser where impurities are dispersed whilst the pulp is relatively cold, which will be advantageous for certain printer's inks, such as laser and

Xerox, whereas the second disc disperser will function as a main disperser whilst the pulp is hot, which will be advantageous in the case of impurities such as so-called stickies and so forth.

- 5 According to the invention, the means for introducing the particulate material into the first disc disperser may to advantage comprise a screw feeder having a hollow shaft for supplying steam to the first disc disperser, thereby obtaining the advantage that the steam is fed centrally into the disc disperser and the pulp therein.
- 10 According to the invention, the means for transferring the particulate material can comprise a screw feeder with a hollow shaft for feeding steam to the interior of the attached disc disperser.

The invention will now be described in more detail with reference to the drawings,
15 wherein:

Figure 1 is a purely schematic illustration of a device according to the invention;

Figure 2 is a purely schematic illustration of a modified embodiment of a device
20 according to the invention; and

Figure 3 is a more artistic perspective view of a plant where a device according to the invention is used.

25 The device illustrated in Fig. 1 comprises a disc disperser 1 with a screw feeder 2. The disc disperser 1 essentially comprises a stator disc 3 and a rotor disc 4, driven by a motor 5. Furthermore, the device comprises a second disc disperser 8, constructed in the same way as the first disc disperser 1, i.e., with a screw feeder 9, a stator disc 10 and
30 a rotor disc 11, driven by a motor 12.

The pulp which is to be processed is introduced into the screw feeder 2 as shown by means of the arrow 6. From the first disc disperser 1 the pulp treated therein passes to the screw feeder 9, as indicated by means of the arrow 7.

35 Dispersed pulp exits the second disperser 8 as indicated by means of the arrow 13.

Steam as a heating medium can be supplied to the first disperser 1 through the hollow shaft 14 of the screw feeder 2, as indicated by means of the arrow 15. The steam can in this way be fed centrally into the disc disperser 1, and thus centrally into the pulp introduced into the disc disperser by means of the screw feeder 2.

5

The second disc disperser 8 has an attached screw feeder 9 having a solid shaft 16.

The device according to the invention may also be realised in a modified form, as shown in Fig. 2. The only difference between the device in Fig. 1 and that in Fig. 2 is that the shaft of the screw feeder 9 is made as a hollow shaft 16', through which steam can be fed as indicated by means of the arrow 17.

Figure 3 shows a plant where the device according to the invention is used. The same reference numerals are used here for the plant components which correspond to those shown in Fig. 2.

The plant comprises a screw press 18, having a pulp inlet 19 and an outlet 20, which goes to a screw feeder 2 via an inflow 6. The screw feeder 2 is attached to a disc disperser 1. The outlet of the disc disperser 1 is connected to a screw conveyor whose function corresponds to the arrow 7 in Fig. 2 and has therefore been given the same reference numeral. The screw conveyor 7 has an outlet which opens into a screw feeder 9, attached to a second disc disperser 8. The outlet of the disc disperser 8 is designated 13 in accordance with the corresponding arrow in Figure 2.

Steam can be fed to the disc disperser 1 and/or 8 according to need through respective steam pipes 15,17 which are connected to the respective hollow shafts 14,16'.

The screw press 18 represents a dewatering zone where the pulp is dewatered. Thence, the pulp passes to the first disc disperser 1. Steam is added in the centre of the disc disperser 1, and can simultaneously also be added in the disc disperser 8, which receives pulp from the disc disperser 1.

In the disc disperser 1 the pulp is mixed well with the added steam at the same time as the size of the pulp particles is reduced.

In the second disperser 8 a reduction of the amount of impurities, such as printer's ink, wax, bitumen and so forth, is carried out in a known way.

The disc disperser 1 may also be used as a predisperser, the two dispersers then operating under different temperature conditions. The predisperser 1 will disperse impurities whilst the pulp is relatively cold, which is advantageous in the case of certain printer's inks such as laser and Xerox, whilst the disperser 8 as main disperser will
5 disperse whilst the pulp is hot, which is advantageous in the case of impurities such as stickies and so forth.

By means of the invention the advantage is obtained that the preheating period is very short, as a consequence of the good mix of steam and pulp and also minimal size of the
10 pulp particles. It will be possible to mix bleaching chemicals into the pulp and/pr improve the efficiency of the actual dispersion of the impurity particles in the pulp.

The device is flexible and provides the possibility of dispersion at two temperature levels, cold and hot pulp respectively (steam supply in the second disperser only).
15

Steam may in addition be added at other points, wherever desirable, such as indicated by means of the arrow D in Fig. 1.

P a t e n t c l a i m s

1.

A device for processing particulate material comprising a grinder (1), means (2) for
5 introducing a particulate material into the grinder; a disc disperser (8) and means (7,9)
for transferring particulate material from the grinder (1) to the disc disperser (8), means
(13) for removing particulate material from the disc disperser (8); and means (14) for
introducing steam into the device to heat the particulate material, characterised in that
the grinder (1) is a disc disperser.

10

2.

A device as disclosed in Claim 1, characterised in that the means (14) for adding steam
open into the disc disperser used as a rapidly rotating grinder (1).

15

3.

A device as disclosed in Claim 2, characterised in that the means (14) for adding steam
open centrally into the first disc disperser (1).

20

4.

A device as disclosed in Claims 1 to 3, characterised in that means for adding steam also
open centrally (16') into the second disc disperser (8).

25

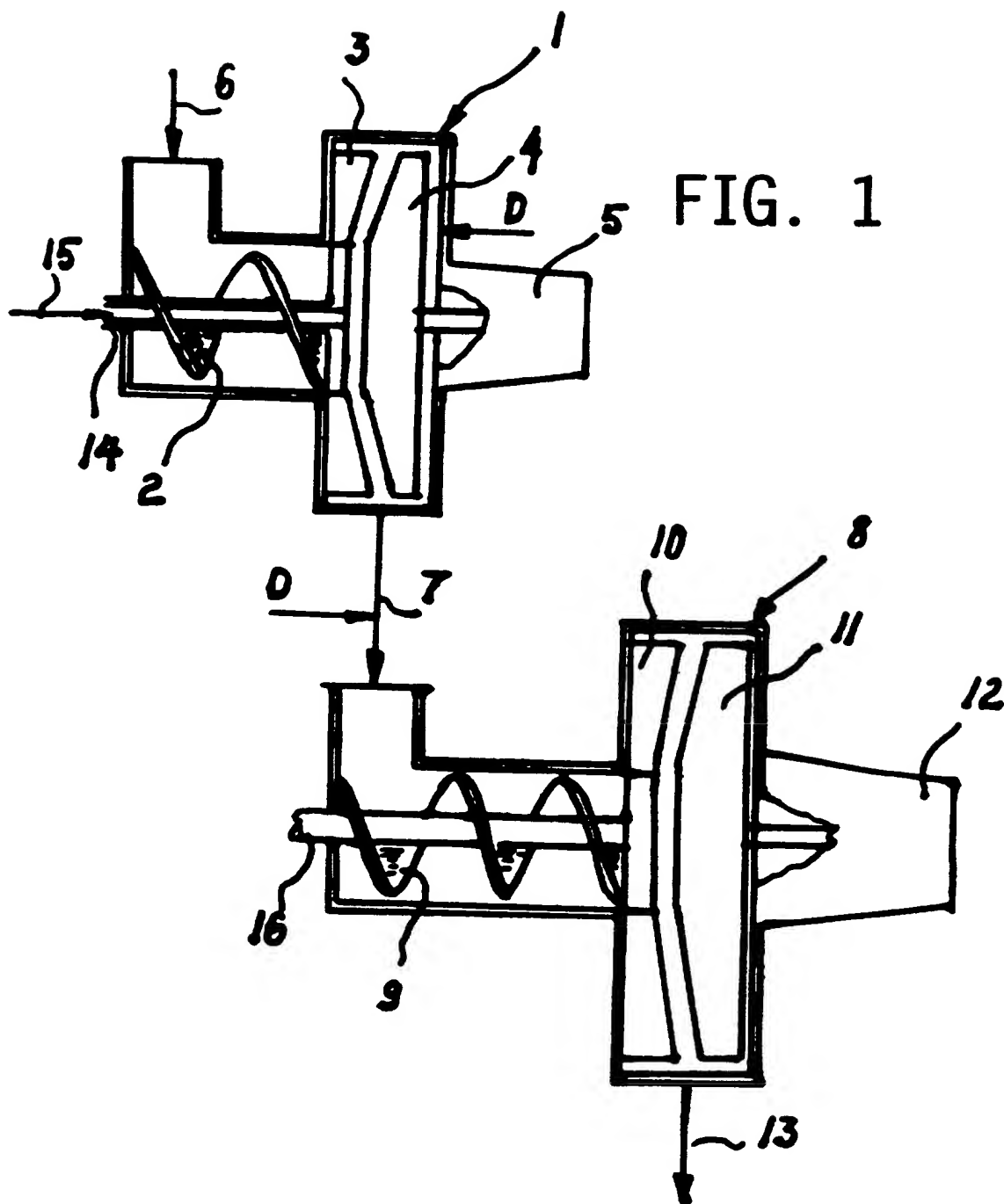
5.

A device as disclosed in one of Claims 1 to 4, characterised in that the means for
feeding the particulate material to the first disc disperser (1) comprise a screw feeder (2)
30 having a hollow shaft (14) for feeding steam (15) to the first disc disperser (1).

6.

A device according to one of Claims 1 to 5, characterised in that the means for
35 transferring particulate material comprise a screw feeder (9) having a hollow shaft (16')
for feeding steam (17).

1/3



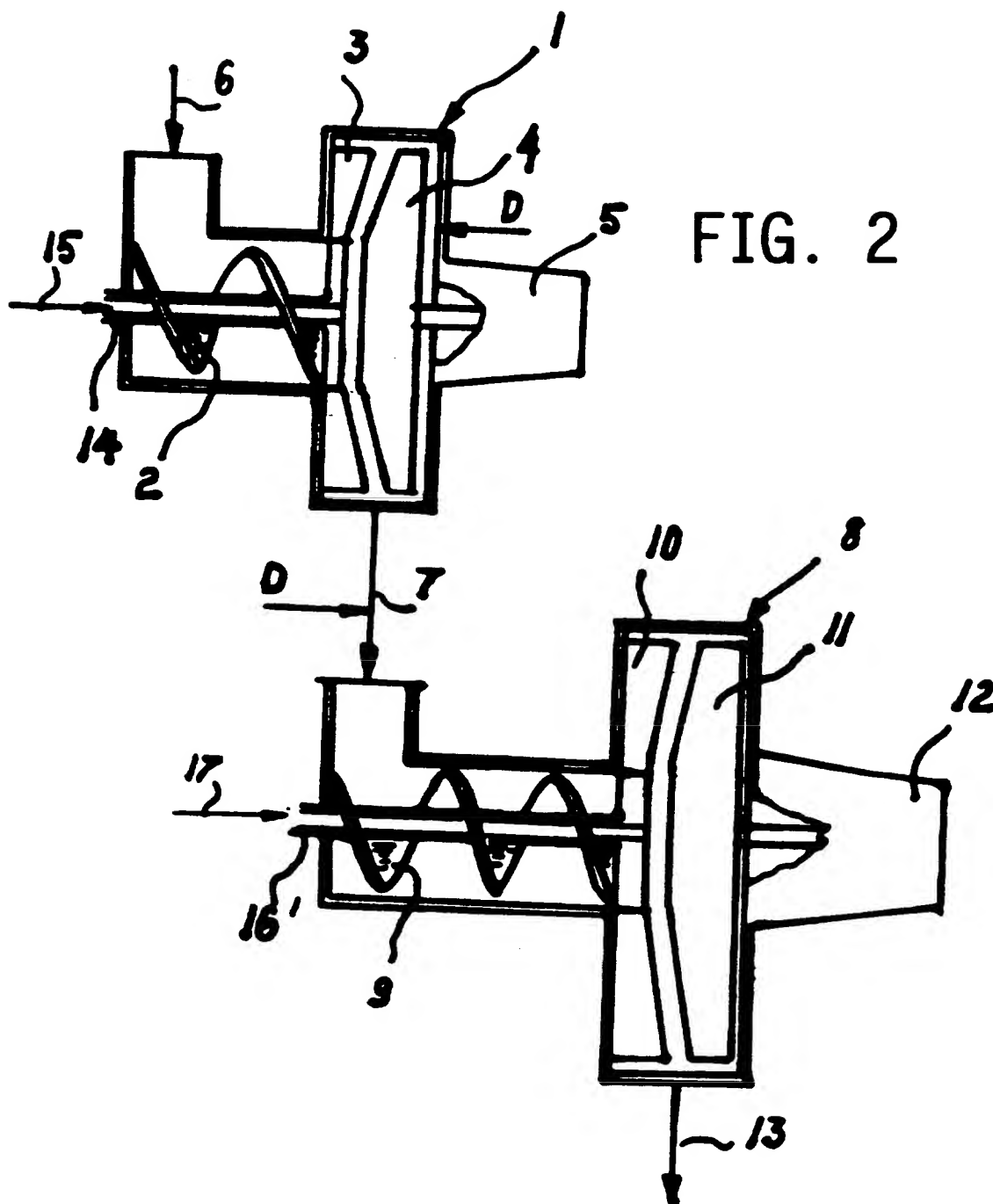
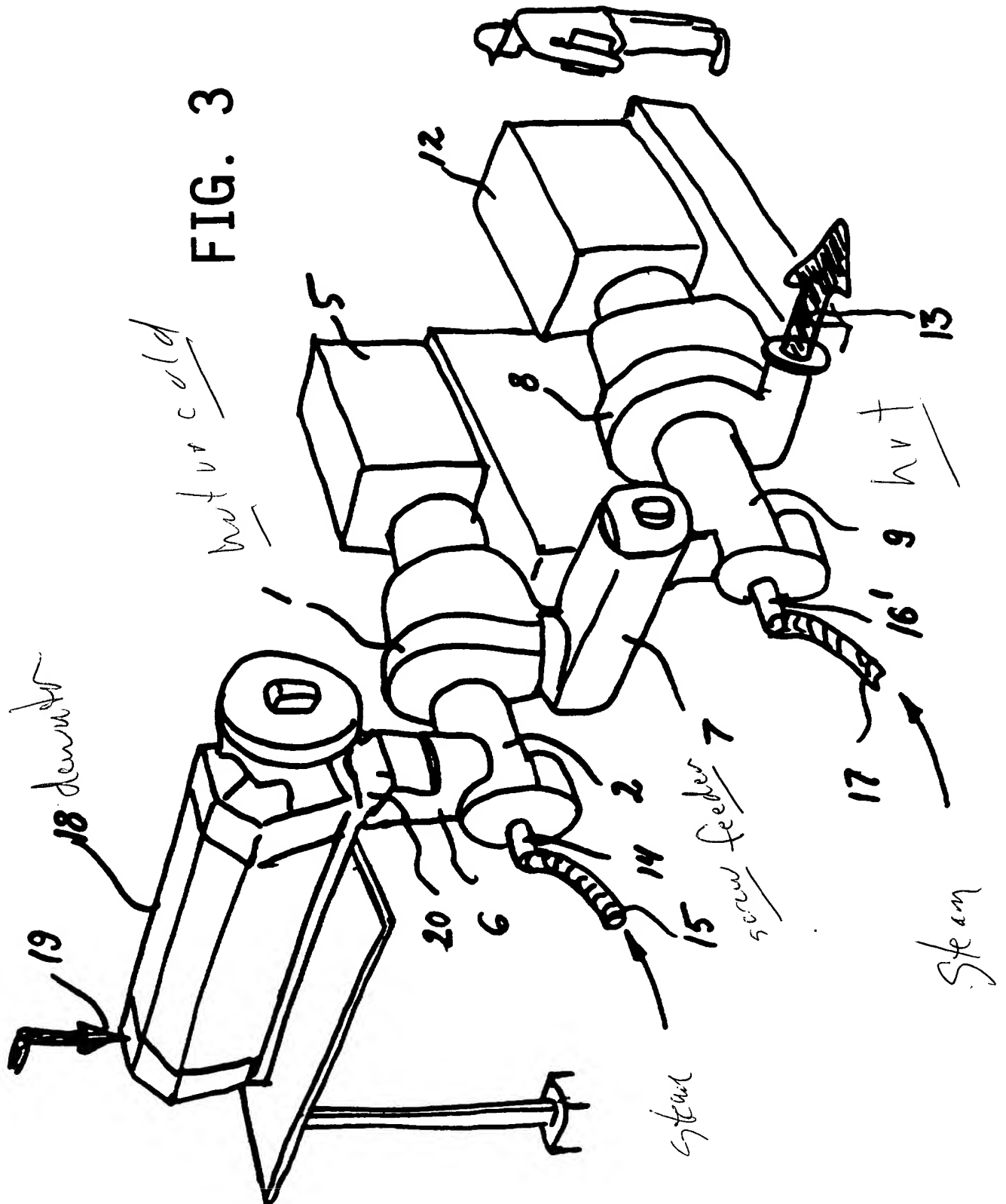


FIG. 3



INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 95/00226

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: D21B 1/12, D21B 1/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: D21B, B02C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|-----------|--|-----------------------|
| X | US 4235665 A (ROLF REINHALL ET AL), 25 November 1980 (25.11.80), column 2, line 15 - line 64; column 3, line 30 - line 41, the figure | 1 |
| Y | --- | 2-6 |
| Y | WO 9427713 A1 (ANDRITZ-PATENTVERWALTUNGS-GESELLSCHAFT M.B.H.), 8 December 1994 (08.12.94), page 2, line 14 - line 18; page 3, line 3 - line 7, figures 1,2, abstract | 2-6 |
| | ----- | |

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

22 March 1996

Date of mailing of the international search report

26 -03- 1996

Name and mailing address of the ISA/

Authorized officer

INTERNATIONAL SEARCH REPORT

Information on patent family members

05/02/96

International application No.

PCT/NO 95/00226

| Patent document cited in search report | | Publication date | Patent family member(s) | | Publication date |
|---|----------|---------------------|----------------------------|----------|---------------------|
| US-A- 4235665 | 25/11/80 | AU-B,B- | 507827 | 28/02/80 | |
| | | AU-A- | 2656277 | 04/01/79 | |
| | | DE-A,B,B | 2729348 | 12/01/78 | |
| | | FR-A,B- | 2356763 | 27/01/78 | |
| | | GB-A- | 1569383 | 11/06/80 | |
| | | JP-C- | 1426198 | 25/02/88 | |
| | | JP-A- | 53035001 | 01/04/78 | |
| | | JP-B- | 62025795 | 04/06/87 | |
| | | SE-B,C- | 413601 | 09/06/80 | |
| | | SE-A- | 7607484 | 31/12/77 | |
| ----- | | | | | |
| WO-A1- 9427713 | 08/12/94 | NONE | | | |